Space Weather Forecast

Issued on Wednesday, 28 December 2022 at 13:27 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Risk of Minor Geomagnetic Storms throughout, peak Chance Friday 30 December. Chance of Moderate-class X-ray flares throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been Moderate over the past 24 hours with an isolated Moderate-Class flare from a large spot in the northwest of the disc at 27/1626UTC. There are currently six sunspot regions on the visible surface of the Sun. The largest and most active region on the disc is in the northeast, which has seen some further spreading and growth of. The second largest region on the disc was responsible for the Moderate-Class flare. One region has recently emerged across the southeastern limb. Other spots are smaller and simpler and have shown slow decaying or stable trends.

Regarding potential sources of Coronal Mass Ejections (CMEs) in the period, most observed minor dimming activity was based on either limb, with a late prominence eruption (27/2100UTC) from the southeast near the assumed location of an arriving spot group, and a later one in the west at 27/2200UTC. One further CME has been observed on LASCO imagery around 28/0924UTC, however this is yet to be analysed by Enlil.

Solar Wind / Geomagnetic Activity: Solar wind speeds were suggestive of possible CME influence overlying a fast wind regime. The assumed sources are the tail end of the (emitted date/time) 24/0230UTC CME, with possible contribution later in the period from the 24/0800UTC CME, although the latter is more conjectural. Measurement of the solar wind parameters remains relatively noisy, with less precision possible than would normally be the case.

The solar wind speed has been Elevated in the past 24 hours on a relatively flat trend. The number of particles measured in the solar wind was especially erratic, owing to differences in character between the two main measuring satellites, however appears to have remained largely on a stable tendency near long-term background throughout. The important north-south component showed signs of fluctuation throughout.

Geomagnetic activity was initially Active (Kp4) with a Minor Geomagnetic Storm G1/Kp 5 interval recorded 27/15-18UTC. Activity since then has tapered down to Quiet (Kp 0-2).

Energetic Particles / Solar Radiation: No solar radiation storms were observed, despite the increase in magnitude of potential generative X-ray flare events.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain Low with Common-class flares, and a daily chance of Moderate flare X-ray activity. The main contributions to these risks come from the largest group on the visible disc, a sunspot in the northeast, as well as a sunspot in the northwest and a region that is arriving in the southeast. A large group in the northwest is expected to depart the Earth-facing side through the course of Day 3 (30 December).

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Solar Wind / Geomagnetic Activity: Solar winds are expected to remain at or just above Elevated levels, before increasing through Days 2 and 3 due to a coronal hole. A CME that left the Sun on 25 December may give a glancing blow to Earth on Day 2 (29 December), although this is low confidence. A CME is apparent on imagery around 28/0924UTC, but is yet to be modelled by Enlil.

There is a Slight Chance of G1/Minor Geomagnetic Storm intervals on all days, rising to a peak Chance on Days 2 & 3 (30-31 December) as a result of the onset of a coronal hole fast wind. Other contributions from CME arrivals are less certain.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, however there is a daily slight chance given the number of large sunspots on the disc and the increased tendency towards Moderate-class X-ray flares.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	10	30	40	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	40	40	40	30
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	5	5	5	5
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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